SOME ASPECTS OF NAVY MANPOWER MANAGEMENT:
CAREER MANNING RATIOS, VARIABLE
REENLISTMENT BONUSES AND PROFICIENCY PAY

by

Sheldon E. Haber

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Sheldon E. Haber[†]

0. Introduction

This paper examines the allocation of Variable Reenlistment Bonuses
(VRB's) and Proficiency Pay (Pro Pay) among Navy ratings, i.e., occupation
specialties. In particular, the assignment of these monetary incentives
to reenlistment in the recent past is evaluated in terms of efficiency and
effectiveness criteria. Subsequent papers will explore improved procedures
for identifying Navy occupations, i.e., ratings, with shortages of person-
nel, and for assigning incentive pays such as the VRB and Pro Pay.
Additionally, attention will be given to economic factors influencing
reenlistment rates to determine, for example, the extent to which current
levels of VRB and Pro Pay are effective in raising reenlistment rates.

I. Background

As specified by the Department of Defense (DOD), personnel shortages
in a military occupation specialty are determined by a measure known as the
career manning ratio. The career manning ratio is a ratio of career inven-
tory or strength to career requirements. Career inventory includes all

enlisted personnel on active duty with more than four years service. Career requirements are measured by extant enlisted billets in pay grade E-5 and above.

One means for increasing the supply of personnel to ratings experiencing shortages is to provide VRB's and Pro Pay. The VRB is payable, with some exceptions, in equal yearly installments during the reenlistment period on first reenlistment in specified occupations to individuals who are entitled to a regular first reenlistment bonus.[1] The VRB is based on multiples (one through four, the latter being the highest payment) of the regular first reenlistment bonus. Since the total of all regular reenlistment bonuses may not exceed $2,000, the maximum VRB is $8,000. Pro Pay is a monthly payment paid to careerists in highly technical specialties of special importance to military needs where the maximum VRB is an insufficient retention incentive. This monthly addition to pay and allowances may be received over successive reenlistments but terminates when the occupation specialty no longer qualifies for Pro Pay. Although Pro Pay is only awarded for superior performance, in practice most individuals in a Pro Pay rating receive it.

In determining whether a rating is eligible for a VRB and/or Pro Pay, three factors are generally mentioned; these are the career manning ratio, total training costs and training time.[2] Obviously, the formulation of explicit criteria for the assignment of VRB's and Pro Pay is not an easy task. As a first step it is useful to see how these monetary supplements to pay and allowances have been allocated in the recent past. This is the

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[1] Regular reenlistment bonuses are lump sum payments awarded to enlisted personnel to induce them to reenlist. Unlike reenlistment bonuses which may be offered at the completion of any contract term, the VRB, which is an extra bonus, can be offered only for the first reenlistment.

[2] Some ambiguity in criteria, however, may be noted. For example, as stated in [2, p. 7514], VRB is "used to assist in attaining and maintaining career manning ratios in critical military specialties with inadequate first term retention rates" [italics added].

subject matter for this paper. Empirical findings are presented in the next section which indicate that improvement in the efficiency and effectiveness of these incentives to reenlistment may be desirable. Concluding comments are contained in the last section.

II. Career Manning Ratios, Variable Enlistment Bonuses and Proficiency Pay: Empirical Findings

In this section empirical relationships between career manning ratios, VRB's and Pro Pay are discussed.[3] In the discussion that follows, it is assumed that the career manning ratio is the best measure for identifying Navy ratings with shortages of personnel. The relationship between career manning ratios and other measures for identifying Navy occupations with personnel shortages, e.g., reenlistment rates, will be examined in a forthcoming paper.

The Department of Defense (DOD) categorizes career manning ratios into four groups as shown below.

DOD Group	Career Manning Ratio
A	Less than 0.75
B	Between 0.76 and 0.89
C	Between 0.89 and 1.10
D	Over 1.10

In practice career manning codes A and B are used to identify military occupation specialties experiencing a shortage of personnel, C and D to identify occupations where supply and demand are equal or where there is a surplus of personnel.

In Table 1, the Navy ratings are grouped according to the DOD classification of military occupations.[4] As can be seen from this table,

[3]The data for the analysis were provided by the Office of the Special Assistant for Enlisted Force Analysis, Bureau of Personnel (Pers AX).

[4]The ratings in each DOD group are shown in the Appendix.

the DOD major occupation groups with the highest percentage of ratings in a shortage status are electronics equipment repairmen, communications and intelligence specialists, and other technical and allied specialties. The occupations with the lowest percentage of ratings in a shortage status are service and supply handlers, administrative specialists and clerks.

TABLE 1

PERCENT OF RATINGS WITH LOW CAREER MANNING RATIOS (CMR), WITH
A VARIABLE REENLISTMENT BONUS (VRB), AND WITH PROFICIENCY
PAY (PRO PAY) BY DOD OCCUPATION GROUP, 1971

DOD Group [a]	Percent of Ratings in DOD Group with		
	Low CMR [b]	VRB [c]	Pro Pay [d]
1. Electronics equipment repairmen (11)	82	100	55
2. Communication and intelligence specialists (6)	83	100	17
3. Medical and dental specialists (2)	50	50	0
4. Other technical and allied specialists (5)	100	40	0
5. Administrative specialists and clerks (9)	56	11	0
6. Electrical/mechanical equipment repairmen (17)	76	65	0
7. Craftsmen (12)	75	33	0
8. Service and supply handlers (4)	0	0	0

[a] Number of different ratings in each DOD group shown in parentheses.

[b] Percent of ratings with a career manning code of A or B.

[c] Percent of ratings providing a Variable Reenlistment Bonus.

[d] Percent of ratings providing Proficiency Pay.

During the last several years the number of ratings with personnel shortages has increased. As indicated by Table 2, in 1965 less than one-third of the ratings had career manning codes of A or B. By 1971, this proportion had increased to more than two-thirds. Of particular importance, there were 18 different ratings which were in a shortage status in 1965 and were still in this status six years later; five of these ratings were in the electronics equipment repairmen occupations and a VRB was given in each in 1965 and in 1971. The length of time that these shortages have persisted suggests that the structure of VRB and Pro Pay and/or the structure of basic pay and allowances have not been sufficiently flexible to equate demand and supply.

TABLE 2

NUMBER OF RATINGS BY CAREER MANNING
CODE (CMC), [a] 1965 AND 1971 [b]

1965 CMC	1971 CMC				
	D	C	B	A	Total
D	2	11	4	1	18
C		4	14	7	25
B			9	2	11
A		2	4	3	9
Total	2	17	31	13	63

[a] Career manning codes A and B indicate a shortage of personnel in a rating.

[b] Information missing for three ratings.

In allocating VRB's and Pro Pay, it is desirable that they be assigned to ratings in an effective and efficient manner. Focusing solely on the career manning ratio for the moment, effective allocation requires that these benefits be assigned to ratings with personnel shortages. By this definition, ineffective allocation occurs when incremental compensation in the form of a VRB or Pro Pay is not provided in a rating experiencing a career manning ratio of A or B. A second measure of performance in the

assignment of VRB's and Pro Pay relates to efficiency. Efficient alloca-
tion requires that these benefits not be assigned to ratings where the
supply of personnel is adequate. The following cases illustrate these
different measures.

	Rating	Career Manning Ratio	Career Manning Code	VRB Code
1)	Hull Technician	.73	A	4
2)	Utilitiesman	.74	A	0 a/
3)	Storekeeper	.94	C	0 a/
4)	Signalman	.90	C	3

a/ Indicates no VRB offered.

All other things being equal, in case 1 the allocation of VRB is effective;
in case 2, ineffective; in case 3, efficient; and in case 4, inefficient.

Although the data in Table 1 indicate that, on the whole, the dis-
tribution of VRB's and Pro Pay is efficient and effective in that it is
concentrated in the occupation groups with the highest proportion of ratings
in a shortage status, further examination of the detailed ratings suggests
that if the career manning ratio, total training cost and training time are
used as the criteria for assignment, effectiveness and efficiency can be
improved. This is indicated first for the VRB and then for Pro Pay.

Some evidence that the effectiveness and efficiency in allocation of
VRB's can be improved is presented in Table 3. As can be seen from this
table, in 1971 almost one-third, 15 of the 47 ratings, with a career manning
code (CMC) of A or B, were not covered by a VRB. On the other hand, a VRB
was provided in more than one-fifth, 4 out of 19, of the ratings with a CMC
of C or D.

TABLE 3

CAREER MANNING CODE (CMC)[a] BY VARIABLE
REENLISTMENT BONUS (VRB) CODE,[b] 1971

1971 VRB	1971 CMC				
	D	C	B	A	Total
[c]	2	13	9	6	30
1					
2		1	2		3
3		1	9	2	12
4		2	13	6	21
Total	2	17	33	14	66

[a] Career manning codes A and B indicate a shortage of personnel in a rating.

[b] The VRB code indicates the relative ratio of the Variable Reenlistment Bonus to the regular first reenlistment bonus.

[c] No Variable Reenlistment Bonus.

As noted above, VRB's are based on the total cost of training[5] and training time as well as on the career manning ratio. Examination of these latter costs indicates that training cost is highly correlated with training time; the coefficient of correlation for these variables is 0.84.[6] For this

[5] Total training cost includes basic training and school training costs. In each case, the costs taken into account are pay and allowances of students, pay and allowances of instructional staff and overhead personnel, expenses of operating and maintaining facilities and other real property, travel, and accrued leave [1]. Hence, the cost figures represent average cost rather than marginal cost, i.e., the incremental cost of training an additional man.

[6] Total training costs ranged from $3,312 for the quartermaster rating to $13,557 for the electronic technicians rating. But the range in training cost per year was very small. Excluding the highest and lowest

reason, only total training cost is considered as a measure of the cost of filling vacancies. Total training cost data are juxtaposed against career manning levels and VRB's in Table 4 in order to further assess the consistency of current VRB allocations.

In Table 4, the ratings are classified into four groups depending on career manning code (CMC) and whether a VRB was offered in the rating. Within each group ratings are distributed according to total training cost. From this table it is seen that total training costs tended to be higher for ratings with a shortage of personnel, i.e., for ratings with a CMC of A or B for which a VRB was given (Group 2), than for ratings with a shortage for which no VRB was assigned (Group 1). Yet there were a number of ratings with shortages of personnel and low training costs that were assigned a VRB and some ratings with a shortage and high training costs that were not assigned a VRB. Additionally, there were ratings where no shortage of personnel was indicated and where a VRB was given (Group 4); for these ratings the spread of training costs was very large.

Similar findings, but primarily relating to effectiveness rather than efficiency, are found with respect to Pro Pay. Unlike the VRB, the amount of Pro Pay is independent of other monetary payments. Three levels of Pro Pay are offered; however, four categories are distinguished since in practice Pro Pay of 50, 75, 100 and 150 dollars per month is paid depending on the particular rating.

From Table 5 it is seen that Pro Pay was offered in seven ratings in 1971. In all but one of these there was a shortage of personnel[7] and in all ratings a VRB was paid. Of 29 other ratings in which a VRB was

quintiles (i.e., excluding ten percent of the ratings that have either very high or very low training costs per year), the range in annual training costs varied between $9,971 and $13,487. Of particular interest, the training cost per annum of stewards, $10,588, was only slightly less than that for aviation fire control technicians, $10,936.

[7] However, of the six ratings with personnel shortages, only two had a career manning code A indicating a severe shortage of personnel.

TABLE 4

TOTAL TRAINING COST BY CAREER MANNING CODE (CMC)
AND VARIABLE REENLISTMENT BONUS (VRB) CODE, 1971

Total Training Cost	Number of Ratings			
	Group 1 [a/]	Group 2 [b/]	Group 3 [c/]	Group 4 [d/]
[e/]	1	2	2	1
3,001 - 4,000	3	2	4	1
4,001 - 5,000	2	5	2	
5,001 - 6,000	6	7	5	
6,001 - 7,000	1	8	1	1
7,001 - 8,000		4		
8,001 - 9,000		1		
9,001 and over	2	3	1	1
Total	15	32	15	4

[a/] CMC codes A and B; no VRB.

[b/] CMC codes A and B; VRB codes 1 through 4.

[c/] CMC codes C and D; no VRB.

[d/] CMC codes C and D; codes 1 through 4.

[e/] Information missing.

TABLE 5

PROFICIENCY PAY (PRO PAY) CODE BY VARIABLE
REENLISTMENT BONUS (VRB) CODE, 1971

1971 VRB b/	1971 Pro Pay a/					
	c/	1	2	3	4	Total
d/	30					30
1						
2	3					3
3	12					12
4	14	1	4	1	1	21
Total	59	1	4	1	1	66

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a/ Monthly Pro Pay of $50, $75, $100 and $150 is designated by codes 1, 2, 3 and 4, respectively.

b/ The VRB code indicates the relative ratio of the Variable Reenlistment Bonus to the regular first reenlistment bonus.

c/ No Pro Pay.

d/ No Variable Reenlistment Bonus.

paid but no Pro Pay offered, five had the additional properties of being short of personnel, requiring technical expertise, and having a training cost in excess of the minimum training cost of $5,062 for ratings receiving Pro Pay.[8]

The preceding discussion assumes that, given the career manning ratio, training time and total training cost, all shortages are of equal importance. In the long run this is true but in the short run it may be argued that some shortages are more important than others. Thus, for

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[8] The ratings for which these conditions prevailed were as follows: Fire Control Technician, Missile Technician, Air Controlman, Photographic Intelligenceman, and Instrumentman.

example, it may be that in the short run the readiness of the total Navy may be reduced more by an unfilled position aboard a destroyer or oil tanker than an unfilled position in a land-based communications center or storage facility, whereas in the long run, all things being equal such as training cost and time, the incremental gain in output resulting from the employment of an additional person in a specialty with a shortage is likely to be independent of the geographical location of the position being filled.

Granting the desirability of differentiating between shortages in the short run, the problem arises as to how to measure the importance of a shortage. For the Navy, the importance of a shortage depends, in part, on how the shortage affects Navy output. Given the current state of the art for measuring this magnitude, Navy output is often stated in terms of ship readiness. This suggests that the percentage of billets in an occupation which are sea jobs might serve as a rough approximation of the impact of a shortage of personnel in that occupation on overall ship readiness. This measure is used in Table 6 to determine the extent to which the assignment of VRB's has been influenced by the consideration of maximizing short run Navy output.[9]

The format of Table 6 is similar to that of Table 4 except that the row stubs show the ratio of sea/total billets for a rating. Ratings for which the sea/total billet ratio is greater (less) than 0.7 are considered to have a relatively large (small) impact on ship readiness. As can be seen from Table 6, for the most part the ratio of sea/total billets is higher for ratings which have been assigned a VRB, for ratings with and without a personnel shortage. Thus, Navy practice in assigning VRB's (and Pro Pay) appears to be weighted toward increasing current ship readiness.[10]

[9]Among other factors, one rationale for assigning greater importance to sea billets is the relative ease of substitutability for filling short positions through the Civil Service or contractor personnel. A more refined measure would take account of differences among ratings in the distribution of sea jobs by type of ship.

[10]It is of some interest to note that the average ratio of ship/total billets is .61 for the 47 ratings with a CMC of A or B and .62 for the 19

TABLE 6

RATIO OF SEA / TOTAL BILLETS BY CAREER MANNING CODE (CMC)
AND VARIABLE REENLISTMENT BONUS (VRB) CODE, 1971

Ratio of Sea / Total Billets	Number of Ratings			
	Group 1 [a]	Group 2 [b]	Group 3 [c]	Group 4 [d]
Less than 0.7	12	15	10	2
0.7 or larger	3	17	5	2
Total	15	32	15	4

[a] CMC codes A and B; no VRB.

[b] CMC codes A and B; VRB codes 1 through 4.

[c] CMC codes C and D; no VRB.

[d] CMC codes C and D; VRB codes 1 through 4.

III. Concluding Remarks

The allocation of Variable Reenlistment Bonuses (VRB) and Proficiency Pay (Pro Pay) is of special importance for at least three reasons. First, with the exception of the enlistment bonus introduced in June 1972, they are the only forms of compensation which permit direct occupational wage differentials within the military.[11] Second, because they constitute a very small percentage, approximately 2.7 percent, of total pay and allowances,[12] proper allocation of occupational incentive pay is especially important. Third, although occupational incentive pay is a small percentage of total pay and allowances, this percentage is likely to increase in the future as the military adapts to the all-volunteer environment. For example, it appears that the regular reenlistment bonus, which is given for reenlistment in any rating whether it be a shortage or surplus rating, is to be phased out and the monies formerly used for this purpose are to be allocated to VRB's. As the VRB increases in importance, the problem of VRB allocation will become even more acute.

This paper has attempted to assess some of the influences underlying current Navy practice in assigning VRB's and Pro Pay. As indicated above, it appears that shortages of career personnel have increased in the Navy over the last several years and that in 1971 shortages of career personnel were experienced in over two-thirds of all ratings. The duration and range of shortages suggest that factors other than assignment of VRB's and Pro Pay account for these shortfalls. Nonetheless, assignment of these monetary

ratings with a CMC of C or D, suggesting that the probability of a rating being short in career personnel may be independent of the proportion of all billets (in the rating) requiring sea duty. The influence of this and other factors on retention will be examined in another paper.

[11]Indirect ways of maintaining differentials in pay exist, however; for example, differential promotion rates within occupation.

[12]From the FY 1973 President's Budget for Military Personnel on Active Duty (see [2, p. 7507]).

benefits in an effective and efficient manner is desirable. Current Navy practice appears to emphasize short run ship readiness in assigning VRB's (and Pro Pay). Although this may not be unreasonable, there were a number of ratings with a shortage for which the cost of filling vacancies was relatively high but where VRB's or Pro Pay were not offered. On the other hand, there were ratings for which supply exceeded or approximately matched demand and yet a VRB was offered. Although the problem of quality of inputs to the VRB and Pro Pay decision process was only briefly examined, the data also suggest that improvement in this area is necessary, particularly in the estimation of annual training costs.

This study indicates the need for a procedure which results in the formulation of explicit assignment criteria that can be employed in a timely manner. One procedure to be explored in a follow-up paper is discriminant analysis. This approach is particularly appropriate in that it can provide a preference ranking of ratings for a VRB and Pro Pay in terms of such input variables as the career manning ratio, the reenlistment rate, total training cost, total training time, and the ratio of sea/total billets. In so doing, the weight of each input variable is given explicitly. The problem of assigning VRB's and Pro Pay is complicated by the fact that career manning ratios may not be the preferred measure for assessing whether a shortage of personnel exists in a rating. Alternative measures need to be examined and likewise will be discussed in the follow-up paper.

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APPENDIX

NAVY RATINGS BY DOD OCCUPATION GROUP

I. ELECTRONICS EQUIPMENT REPAIRMEN

AQ   Aviation Fire Control Technician
AT   Aviation Electronics Technician
AX   Aviation Anti-Sub Warfare Technician
DS   Data Systems Technician
ET   Electronics Technician
EW   Electronics Warfare Technician [a]/
FT   Fire Control Technician
MT   Missile Technician
OT   Ocean Systems Technician
ST   Sonar Technician
TD   Tradesman
TM   Torpedomans Mate

II. COMMUNICATIONS & INTELLIGENCE SPECIALISTS

AC   Air Controlman
AW   Aviation Anti-Sub Warfare Operator
CT   Communications Technician [b]/
PT   Photographic Intelligenceman
RD   Radarman
RM   Radioman
SM   Signalman

III. MEDICAL & DENTAL SPECIALISTS

DT   Dental Technician
HM   Hospital Corpsman

IV. OTHER TECHNICAL & ALLIED SPECIALISTS

AG   Aerographers Mate
DM   Illustrator Draftsman
EA   Engineering Aid
MU   Musician
PH   Photographers Mate

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[a]/New rating excluded from the analysis.

[b]/Old rating excluded from the analysis. Now disaggregated as follows: CTA Communications Technician (Administrative); CTI Communications Technician (Interpretive); CTM Communications Technician (Maintenance); CTO Communications Technician (Communications); CTR Communications Technician (Collection); CTT Communications Technician (Technical).

V. ADMINISTRATIVE SPECIALISTS & CLERKS

AK Aviation Storekeepers
AZ Aviation Maintenance Administrationman
DK Disbursing Clerk
DP Data Processing Technician c/
JO Journalist
PC Postal Clerk
PN Personnelman
SK Storekeeper
YN Yeoman

VI. ELECTRICAL/MECHANICAL EQUIPMENT REPAIRMEN

AB Aviation Boatswains Mate
AD Aviation Machinists Mate
AE Aviation Electricians Mate
AM Aviation Structural Mechanic
AO Aviation Ordnanceman
AS Aviation Support Equipment Technician
BR Boilermaker
BT Boilerman
CM Construction Mechanic
EM Electricians Mate
EN Engineman
GM Gunners Mate
IC Interior Communications Electrician
IM Instrumentman
MM Machinists Mate
MN Mineman
OM Opticalman

VII. CRAFTSMEN

BM Boatswains Mate
BU Builder
CE Construction Electrician
EO Equipment Operator
HT Hull Technician d/
LI Lithographer
ML Molder
MR Machinery Repairman
PM Patternmaker
QM Quartermaster
SW Steelworker
UT Utilitiesman

---

c/ Changed from MA Machine Accountant.

d/ Combines SF Shipfilter and DC Damage Controlman.

VIII. SERVICE & SUPPLY HANDLERS

      CS Commissaryman
      PR Aircrew Survival Equipmentman
      SD Steward
      SH Ships Serviceman

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  Boston
  Chicago
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Naval Research Lab, Code 2627
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Support Forces Manpower & Logist Br
Systems Analysis Div
HQ, USMC
  Commandant (AOIM-2)
  DCS (Manpower)
  Manpower Mgmt Info Sys Br
  Manpower Plan/Prog & Budget Br
  Personnel Res Br
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ARMY
  OAS (M&RA), Manpower
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      Dr. G. A. Eckstrand
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  Chief of Res and Dev
    Behavioral Sci Div
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AIR FORCE
  Aeromedical Library (SCL-4)
    Brooks AFB
  Aerospace Med Res Lab
    Wright-Patterson AFB
  Chief, Pers Res & Anal Div

OSD
  Environmental & Life Sciences
  Human Resources Research (ARPA)
  Manpower Research
  Manpower Res & Utilization

OTHER
  Columbia University
    Bur Applied Social Research
    Prof. Paul F. Lazarsfeld